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EXAMINER
WERNER, DAVID N

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NOTIFICATION DATE	DELIVERY MODE
04/28/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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DETAILED ACTION

1.   This Office action for U.S. Patent Application 10/802,428 is responsive to the

Appeal Brief filed 19 January 2010, in reply to the Final Rejection of 20 August 2009.

Claims 1–3, 5, 7–15, 17, 19–25, and 27 are pending.

2.   In the previous Office action, Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 were

rejected under 35 U.S.C. § 103(a) as obvious over "Motion-based Segmentation Using

a Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view of "K-

Harmonic Means–A Data Clustering Algorithm" (*Zhang*). Claims 8, 9, 20, and 21 were

rejected under 35 U.S.C. § 103(a) as obvious over *de Smet* in view of *Zhang* and in

view of "A Video Segmentation Algorithm for Hierarchical Object Representations and

its Implementation" (*Herrmann*). Claim 27 was rejected under 35 U.S.C. 103(a) as

obvious over *de Smet* in view of *Zhang* and in view of U.S. Patent No. 6,084,912 A

(*Reitmeier*).

3.   In view of the Appeal Brief filed on 19 January 2010, PROSECUTION IS

HEREBY REOPENED. New grounds of rejection under 35 U.S.C. §§ 101 and 103 are

set forth below.

        To avoid abandonment of the application, applicant must exercise of the

following two options:

        (1) file a reply under 37 § CFR 1.111 (if this Office action is non-final) or a reply

under 37 CFR § 1.113 (if this Office action is final); or

(2) initiate a new appeal by filing a notice of appeal under 37 CFR § 41.31

followed by an appeal brief under 37 CFR § 41.37. The previously paid notice of appeal

fee and appeal brief fee can be applied to the new appeal. If, however, the appeal fees

set forth in 37 CFR § 41.20 have been increased since they were previously paid, then

applicant must pay the difference between the increased fees and the amount

previously paid.

A Supervisory Patent Examiner (SPE) has approved of reopening prosecution by

signing below:

/Mehrdad Dastouri/

Supervisory Patent Examiner, Art Unit 2621

Response to Arguments

A.   **Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 were rejected under 35 U.S.C. §**

        103(a) as unpatentable over "Motion-based Segmentation Using a

        Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view

        of "K-Harmonic Means—A Data Clustering Algorithm" (*Zhang*).

        1.   **Claims 1–3, 7, 10–12, 25.**

Applicant makes two arguments regarding Claim 1: first, that the parameter $q(i,k)$

in the *Zhang* reference is not a "probability", as asserted in the previous Office actions,

and second, "that a person of ordinary skill in the art would not have been prompted to

combine the teachings of" the *de Smet* and *Zhang* references. The first argument is persuasive and the second is not.

a) Membership probability

Applicant states that the parameter $q(i,k)$ in equations 6.2 and 7 of *Zhang* has a dimension of distance, and so cannot be a probability, which is inherently dimensionless. Applicant confirms that parameter $d(i,min)$ is a distance measurement. Upon further review of *Zhang*, it appears that the true probability function is $p(i,k)$, which is shown in equation 6.4 to be dimensionless. This is also confirmed in page 7, which calls $p(x|m)$ a "prior probability" and $p(m(l))$ a "mixing probability". *Zhang* is reinterpreted with $p(i,k)$ mapped with the claimed membership probability. This substantive re-interpretation of *Zhang* is considered a new ground of rejection. This Office action is non-final[1].

b) Reason to combine

Applicant states that due to "significant differences" between the claimed invention and the prior art references, one of ordinary skill in the art would not be motivated to combine their teachings. The examiner disagrees.

The *de Smet* reference was directed to a "motion-based image segmentation" based on a K-means clustering method. *De Smet*, § 4. *De Smet* noted that the K-

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[1] The new claim rejections under 35 U.S.C. § 101 based on revised interpretation of *Nuijten* are also new grounds of rejection that make this action non-final.

means method could "perform quite well", particularly since it "distinguished the areas with smaller or different background motion". *Id. De Smet* concluded by inviting future improvements, such as replacing components with "various other techniques", and exploring "other regrouping and clustering strategies" with the possibility of "even better results". *Id.*

The *Zhang* reference describes the K-Harmonic Means clustering algorithm. *Zhang*, abstract. *Zhang* faults the K-means clustering method due to its sensitivity to the initialized positions of clustering centers. *Id.* The K-Harmonic Means method is specifically designed as an alternative clustering method to the K-means method, which improves on the K-means method by eliminating the problematic initialization sensitivity. *Id.*

In combining two prior art references to show obviousness under 35 U.S.C. § 103(a), "there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness". *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (U.S. 2007) (*quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). One of these rationales noted by the Supreme Court is "the application of a known technique to a piece of prior art ready for the improvement". *Id.* at 401. To use this test as a basis for rejection, an examiner must 1) find "that the prior art contained a 'base' device (method, or product) upon which the claimed invention can be seen as an 'improvement'"; 2) must find "that the prior art contained a known technique that is applicable to the base device (method, or product)"; 3) must find "that one of ordinary skill in the art would have recognized that applying the known technique would have

yielded predictable results and resulting in an improved system"; and 4) present

"whatever additional findings based on the *Graham* factual inquiries may be necessary,

in view of the facts of the case under consideration, to explain a conclusion of

obviousness". MPEP § 2143(D).

In this case, 1) the *de Smet* reference contains a "base" method of motion

segmentation in images, using the K means clustering method. 2) The *Zhang* reference

contains the known K-Harmonic Means clustering technique. Since it is designed as an

improved K-Means technique, as presented in *de Smet*, it is presumed to be applicable

wherever the K-Means technique is, such as in motion segmentation. 3) Since the K-

Harmonic Means clustering technique solves a specific known problem with the K-

Means clustering technique: improper sensitivity to initialization, one having ordinary

skill in the art would recognize the predictable results and the improved system in which

the K-Harmonic Means technique replaces the K-Means technique, namely: greater

freedom in setting uncertain initial values (or even random or evenly-spaced values) for

clustering centers during initialization, with less concern over producing inaccurate

clusters. 4) It does not appear that a formal inquiry into *Graham* is necessary, but the

Graham factors will be briefly discussed. Regarding the scope and contents of the prior

art, see the above discussion of *de Smet* and *Zhang* earlier in this paragraph.

Regarding the difference between the prior art and the claims, neither of the two prior

art references individually disclose the claimed use of K-Harmonic Means for the

application of motion trials, with *de Smet* using the old K-Means technique for this

application and *Zhang* only giving a general, theoretical overview of the K-Harmonic

Means technique without details of applications. Regarding the level of ordinary skill in

the art, this would be a high level of skill–higher than in most video processing patent

applications due to the relatively abstract nature of the claims–but within the scope of

the *de Smet* and *Zhang* references and the present application, there is no indication

that any of these three documents is more difficult to comprehend than the other two.

Regarding additional objective evidence, Applicant has not presented any evidence of

secondary considerations.

Based on the facts presented within the prior art documents, there is no evidence

in the record that the well-established "base plus improvement" test of obviousness was

improperly used.

2.   **Claim 5.**

Applicant's assertion against claim 5 is not persuasive. In the initial iteration of

the recursive K-Harmonic Means algorithm of *Zhang*, every component of the algorithm

is inherently initialized, including the regression function, as the result of the first

iteration, as the values input as initialization center points cascade through the

algorithm.

3.   **Claims 13–15, 19, 22–24.**

Applicant does not argue Claim 13 and its dependent claims on their own merits,

but merely as Claim 13 is analogous in scope with Claim 1. Examiner does not dispute

Applicant's assertion that the motion estimation method described in the "wherein"

clause in Claim 13 is analogous to the method described in Claim 1. The examiner

declines to discuss these claims further than what is already stated in the Final

Rejection and the discussion of Claim 1 in § A.1.

      4.   **Claim 17.**

Applicant correctly asserts that Claim 17 is analogous in scope with Claim 5. The

examiner's response to the argument against Claim 5, presented in § A.2., is fully

incorporated as applicable to Claim 17.

B.   **Claims 8, 9, 20, and 21 were rejected under 35 U.S.C. § 103(a) as**

       unpatentable over *de Smet* in view of *Zhang* and further in view of "A Video

       Segmentation Algorithm for Hierarchical Object Representations and its

       Implementation (*Herrmann*).

       1.   **Claims 8, 9, 20, 21.**

Applicant does not argue Claims 8, 9, 20, and 21 on their own merits, but merely as

dependent on their base claims.

C.   Claim 27 was rejected under 35 U.S.C. § 103(a) as unpatentable over _de_

Smet in view of _Zhang_ and in view of U.S. Patent No. 6,084,912 (_Reitmeier_).

1.   Claim 27.

Applicant argues Claim 27 is allowable both as analogous in scope with Claim 1,

discussed above in § A.1., and on its own merits. Applicant states that since _Reitmeier_

discloses a "video coder", the examiner erred in relying on this prior art to teach a

general purpose computer, as examiner interpreted the means-plus-functions claim

language in view of the specification under 35 U.S.C. § 112, ¶ 6.

In the Final Rejection, examiner relied on col. 2: lines 64–67 of _Reitmeier_ as

disclosing the claimed general-purpose computer. This section of _Reitmeier_ reads: "In

fact, the video encoder can be implemented as a software application residing in the

memory of a general purpose computer (not shown) or stored within a storage medium,

e.g., a disk". Applicant fails to specify 1) how this section of _Reitmeier_ does not or

cannot disclose the claimed general purpose computer despite its plain meaning to the

contrary; or 2) why the examiner erred in interpreting Claim 27 under 35 U.S.C. § 112, ¶

6 as directed to a general-purpose computer, such as by presenting a preferred

alternative interpretation in the specification. Applicant has not met its burden in

overcoming the _prima facie_ case of obviousness with respect to _Reitmeier_, and so, the

rejection of Claim 27 is sustained, incorporating the new interpretation of _Zhang_.

Claim Rejections - 35 USC § 101

4.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5.   Claims 1–3, 5, and 7–12 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Current Office policy requires that the phrase "non-transitory" be added to and the word "storage" be removed from all *Beauregard* claim preambles. *See* "Subject Matter Eligibility of Computer Readable Media", 1351 Off. Gaz. Pat. Office 212 (February 13, 2010).

Claim Rejections - 35 USC § 103

6.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7.   Claims 1–3, 5, 7, 10–15, 17, 19, and 22–25 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Motion-based Segmentation Using a Thresholded Merging Strategy on Watershed Segments" (*de Smet*) in view of "K-Harmonic Means—A Data Clustering Algorithm" (*Zhang*). *De Smet* discloses using an iterative segment-merging technique to determine information for an image (abstract).

         Regarding claims 1, 13, and 25, in *de Smet*, an initial motion field is first determined with a block-matching technique on 4 x 4 blocks. *De Smet,* § 2.1. These initial block motion vectors are used for the initial segmentation. *Id.* at § 2.3. Then, the step of performing the block-based motion estimation is the claimed step of "providing

data points". Next, the segments are iteratively merged according to similar or shared motion, according to the K-means clustering algorithm. *Id.* This is the claimed step of "clustering the data points". When this process is finished, the result is a series of large segments corresponding to distinct moving regions of an image, each with an associated motion vector. *Id.* This is the claimed step of "providing motion estimation". However, the present invention specifies performing regression clustering according to a K-Harmonic Means function, which is not the same as the K-means function of *de Smet*.

Zhang discloses the K-Harmonic Means data clustering algorithm. Regarding claim 1, 3, and 25, *Zhang* teaches selecting K centers $m(l)$ from N data points $x(i)$ (pg. 1), initializing center points (pg. 2) and performing an initial iteration (pg. 5), and calculating distance $d(i,l)$ between data point $x(i)$ and center point $m(l)$ (pg. 4), calculating membership probability $p(i,x)$ based on the distance via parameters $q(i,k)$ and $q(i)$ (pg. 5), and stopping when the recursively-calculated performance value stabilizes, that is, when its change with each iteration becomes small (pg. 5). Then, the K calculations of centers $m(l)$ are the claimed "regression functions" for performing regression clustering according to the K-harmonic means function. The calculation of each iteration of the recursive function is the claimed recalculation based on the membership probability, as $m(k)$ is dependent on probability function $p(i,k)$. The stabilization is the claimed "stopping criterion".

De Smet et al. discloses the claimed invention, except for using K-Harmonic Means function to perform regression clustering. Zhang et al. teaches that it was known

to perform data clustering with the K-Harmonic means function. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to perform clustering based on a K-Harmonic means function, as taught by Zhang et al., rather than a linear function such as the K-means function of de Smet et al., since Zhang et al. states in the abstract that K-harmonic clustering is less sensitive to detrimental effects from sub-optimal initialization than conventional clustering techniques. Additionally, the K-harmonic means function was specifically designed as an improved version of the K-means function, which "significantly improves the quality of clustering results" compared with K-means (abstract). Then, the de Smet et al. algorithm contains a basic method which the present invention is an improvement thereof. The prior art Zhang et al. describes a known technique, the K-Harmonic means clustering algorithm, applicable to the base segmentation method of de Smet et al., by substituting it for the K-means algorithm. Then, one having ordinary skill in the art would have recognized that applying the K-harmonic means algorithm of Zhang et al. to de Smet et al. would have yielded the predictable result of "significantly [improved] quality of clustering results" and resulted in an improved system. Therefore, it is respectfully submitted that the use of K-harmonic clustering in de Smet et al. is considered obvious, since it has been held that applying a known technique to a known method ready for improvement to yield predictable results involves only routine skill in the art. *Dann v. Johnston*, 425 U.S. 219, 230, 189 USPQ 257, 261 (1976); *In re Nillsen*, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988).

Regarding Claims 2, 3, 14, and 15, as previously mentioned, *de Smet* produces a motion vector for each segment in an image. *De Smet*, § 2.3. As a result, the most important moving areas are determined. *Id.* at § 3. This is the claimed production of motion vectors and at least one motion path.

Regarding Claims 5 and 17, in *Zhang*, a clustering in which initialization is randomized is described (pg. 11). Since Applicant admits in page 10 of the 19 January Appeal Brief that this initialization is an initialization of the algorithm as a whole, it inherently contains an initialization of the regression function.

Regarding Claims 10 and 12, in *de Smet*, pixels are set as (x, y, t) triples, with x and y as spatial coordinates and t as a time coordinate. *De Smet*, § 2.2.

Regarding Claims 11 and 23, *de Smet* illustrates motion fields. *De Smet*, figs. 3–6. Although these motion fields are not shown as overlaid on the images, the examiner takes Official Notice that it was well-known in the art at the time of the invention to display a motion field superimposed on an image to provide a visual representation of motion vectors.

Regarding Claims 12 and 24, *de Smet* illustrates highlighted motion segments overlaid on an image. *De Smet*, figs. 11, 12.

8.   Claims 8, 9, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *de Smet* in view of *Zhang* as applied to claims 1 and 13 above, and further in view of "A Video Segmentation Algorithm for Hierarchical Object Representations and its Implementation" (*Hermann*). Claims 8, 9, 20, and 21 disclose

using color information to segment techniques, but *de Smet* only discloses "standard watershed techniques" to perform initial segmentation without providing details. *De Smet*, § 2.2.

Hermann discloses a method for image segmentation to extract objects from a moving image. Regarding Claim 8, 9, 20, and 21, after an initial block-matching motion estimation, similar to that in *de Smet*, images are segmented according to specific color information, followed by shape analysis, and lastly motion analysis to merge regions to determine objects. *Herrmann*, § II. This color, shape, and motion information form the claimed "predetermined criteria". In color analysis, a region is determined as homogeneous if the pixel difference in the region is below a threshold. Homogenous, connected areas are determined as "quasi-flat zones". These quasi-flat zones are further processed and become the basis for further segmentation. *Id.* at § II.B. Then, the color analysis is the claimed step of "portioning data according to color".

De Smet, in combination with *Zhang*, disclose a majority of the features of claims 8, 9, 20, and 21 of the claimed invention, as discussed above, except for color segmentation. *Herrmann* teaches that it was known to segment a moving image according to color. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to determine image segmentation by color as taught by *Herrmann*, since *Herrmann* teaches in p. 205, ¶ 3, that color analysis produces the most accurate type of segmentation.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over *de Smet* in view of *Zhang* and in view of U.S. Patent 6,084,912 A (*Reitmeier*). Claim 27 is in means-plus-function format, complying with 35 U.S.C. 112, ¶ 6. Accordingly, the "system" of claim 27 will be limited to a general-purpose computer such as a PC, as illustrated in figure 5 of the specification of the present invention. Although it is implied that the algorithms of *de Smet* and *Zhang* are computer-operated, neither *de Smet* nor *Zhang* explicitly teach this.

Reitmeier discloses a video encoder. This encoder may operate on MPEG-4 video (col. 1: line 57), as specified in ¶¶ 6, 7 of the present invention as a codec on which the present invention is applied. Regarding Claim 27, the encoder of *Reitmeier* may operate as a software application on a general-purpose computer. *Reitmeier*, col. 2: lines 64–67.

De Smet, combined with *Zhang*, discloses the claimed invention except for encoding video on a general-purpose computer. *Reitmeier* teaches that it was known to implement an MPEG-4 encoder as software embedded on a computer. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to encode the system of *de Smet* and *Zhang* in a software MPEG-4 encoder embedded on a computer, as taught by *Reitmeier*, in order to perform computationally complex functions such as motion compensation, quantization, and variable-length encoding inherent in the video coding process.

Conclusion

9.   Examiner formally requests an interview with Applicant's Representative prior to

the written reply to this Office action. Proposed topics of discussion include the support

for the claimed regression function in the specification, Applicant's interpretation of

equations 6.1–6.5 in the *Zhang* reference, and any difference between the presently-

disclosed K-Harmonic Means function and the K-Harmonic Means function as

presented in the *Zhang* reference.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to David N. Werner whose telephone number is (571)272-

9662. The examiner can normally be reached on Monday-Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

Information regarding the status of an application may be obtained from the

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/D. N. W./
Examiner, Art Unit 2621

/Mehrdad Dastouri/
Supervisory Patent Examiner, Art Unit 2621